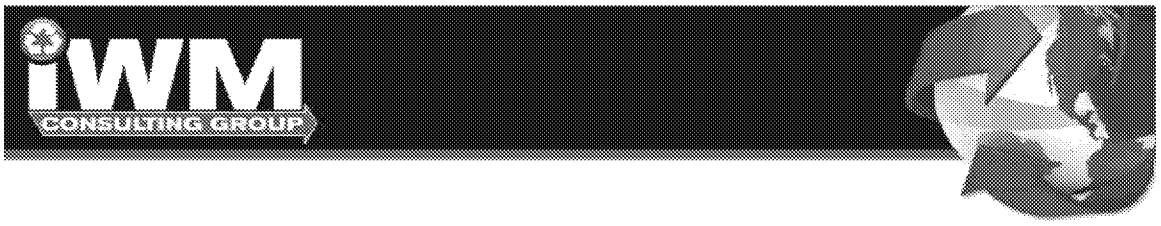

ADDITIONAL OFF-SITE GROUNDWATER INVESTIGATION WORK PLAN

Franklin Power Products, Inc. / Amphenol Corporation
Administrative Order on Consent, Docket #R8H-5-99-002
EPA ID # IND 044 587 848
980 Hurricane Road
Franklin, Indiana 46131

Prepared For:

Carolyn Bury
United States Environmental Protection Agency, Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

Date: February 12, 2019

Prepared by:

IWM Consulting Group, LLC
7428 Rockville Road
Indianapolis, IN 46214
Phone No. (317) 347-1111
Fax No. (317) 347-9326

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FIGURES

ATTACHMENTS

7428 Rockville Road | Indianapolis, IN 46214 | 317.347.1111 office | 317.347.9326 fax

February 12, 2019

Ms. Carolyn Bury
Project Manager
Corrective Action Section 2
Remediation and Re-use Branch
U.S. Environmental Protection Agency, Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3590

Re: **Additional Off-site Groundwater Investigation Work Plan**
Franklin Power Products, Inc./Amphenol Corporation
Administrative Order on Consent, Docket # R8H-5-99-002
EPA ID # IND 044 587 848
980 Hurricane Road
Franklin, Indiana 46131

Dear Ms. Bury:

In accordance with the United States Environmental Protection Agency (USEPA) letter dated December 11, 2018, Industrial Waste Management Consulting Group, LLC (IWM Consulting), on behalf of the "Performing Respondent", Amphenol Corporation (Amphenol), is submitting this *Additional Off-site Groundwater Investigation Work Plan* (Work Plan). Due to the USEPA being on a government mandated furlough, a "Draft" Work Plan was submitted on January 18, 2019 to meet the requested reporting deadline. This Work Plan outlines the proposed work activities relating to the investigation and delineation of dissolved phase volatile organic compounds (VOCs) in the groundwater and the topography of the top of "Unit C" within the Study Area. The proposed work actities in this Work Plan are scheduled to be completed in conjunction with the proposed work activities associated with the *Design-Level Data Soil Invcestigation Work Plan.* The Study Area includes portions of streets that are near and downgradient of the Former Amphenol facility located at 980 Hurricane Road, Franklin, IN (Site), including Hurricane Road, Upper Shelbyville Road, Hamilton Avenue, Forsythe Street, Glendale Drive, and Ross Court.

The primary objectives of the proposed work activities are as follows:

- Obtain additional lithological information in order to document the approximate topographical surface of Unit C in order to further evaluate the possibility of Unit C controlling the local groundwater flow direction within the southern portion of the Study Area.

- Complete additional delineation of the lateral extent of dissolved phase VOCs in groundwater to USEPA Maximum Contaminant Levels (MCLs) and/or Vapor Intrusion Screening Levels (VISLs) and verify groundwater impacts are defined prior to reaching Hurricane Creek. There are two (2) primary areas where additional delineation will be

completed. The first area is north of Ross Court and the investigation will include borings installed west of Forsythe Street. The second area is south of Ross Court and includes borings installed both west and east of Forsythe Street, but all of the borings will be installed north of Hurricane Creek.

The investigation will also allow for the following activities to be completed:

- In order to supplement the *Design-Level Data Soil Investigation Work Plan*, soil samples will be obtained from select temporary well boring locations along the right-of-way (ROW) of North Forysthe Street and submitted for laboratory analysis. The results will be incorporated into the *Off-Site Interim Measure Work Plan*.

- Integration of historic (if feasible), recent, and newly obtained lithological data. This data will be utilized to determine the approximate topography of Unit C and to evaluate if Unit C could be controlling the local groundwater flow direction.

- Utilize groundwater data to determine if additional delineation activities are warranted and to assist in the development of the off-site interim measure work plan.

This Work Plan outlines the proposed methodology and sampling activities that will be utilized during the Work Plan implementation activities. A site vicinity map is provided as **Figure 1**, which displays the location of the Site and properties in the vicinity of the Site. **Figure 2** displays the location of the existing onsite and offsite groundwater monitoring well network, temporary monitoring wells installed in October 2018, and includes proposed locations for the installation of additional temporary monitoring wells if off-site access is granted in all locations requested. **Figure 3** displays the location of the existing onsite and offsite groundwater monitoring well network, temporary monitoring wells installed in October 2018, and includes proposed locations for the installation of additional temporary monitoring wells if off-site access is denied in all locations requested. A combination of the proposed temporary monitoring well locations on the two figures may be implemented if access is granted in some areas and not in others.

A copy of the December 11, 2018 USEPA letter is provided as **Attachment A,** including an email correspondence from the USEPA dated December 19, 2018 which confirmed that the Work Plan due date is January 20, 2019 and not December 20, 2018. Due to the governmental mandated furlough of the USEPA, a *Draft Additional Off-site Groundwater Investigation Work Plan* was submitted on January 18, 2019. This Work Plan is being submitted in response to comments from the USEPA via email and teleconference from February 6, 2019 on the "Draft" Work Plan.

Proposed Boring Advancement and Temporary Well Installation

The proposed boring and temporary well locations were selected in order to provide additional delineation of dissolved VOC impacts in groundwater related to the release from the former Amphenol facility to MCLs or VISLs to the west of Forsythe Street and to the south of Ross Court and east of Forsythe Street near Hurricane Creek.

The proposed work activities include the advancement of soil borings and the installation of temporary wells within the first observed saturated sand unit (historically identified as "Unit B") which is typically observed at depths ranging from 2.6 to 19.5 feet below ground surface (bgs). Unit B is an unconfined water bearing sand unit and Unit B is underlain by a silty clay unit (previously identified as "Unit C") with a thickness historically documented to be approximately 20-25 feet. Once the temporary wells have been installed, groundwater samples will be obtained from the saturated interval within Unit B in order to document the presence or absence of dissolved VOCs.

As depicted on **Figure 2**, if off-site access can be obtained in all requested locations, IWM Consulting recommends advancing up to twenty-three (23) soil borings which will be converted into temporary wells (TW-15 through TW-37). Please note that the proposed locations are access dependent on public access to the right-of-way (ROW) along North Forsythe Street (TW-15 and TW-16), the sanitary sewer line west/southwest of Forsythe Street (TW-20 through TW-23), and on the City of Franklin Street Department property (TW-17, TW-18, and TW-19), in addition to private access to the south of Ross Court and east of Forsythe Street (TW-24 and TW-25), to 400 North Forsythe Street (TW-30 through TW-37), and to 600 North Forsythe Street (TW-26 through TW-31). Please note, the proposed locations for temporary wells TW-30 and TW-31 were placed so that they could be completed on either the 400 or 600 North Forsythe Street properties, in the event one owner would grant access and the other owner would deny access. If access is granted to both properties, wells TW-30 and TW-31 will be placed on the 400 North Forsythe Street property.

As depicted on **Figure 3**, if off-site access is denied in all requested locations, IWM Consulting recommends advancing eleven (11) soil borings which will be converted into temporary wells (TW-15 through TW-25). Please note that the proposed locations are access dependent on public access to the right-of-way (ROW) along North Forsythe Street (TW-15, TW-16, TW-24, and TW-25), the sanitary sewer line west/southwest of Forsythe Street (TW-20 through TW-23), and on the City of Franklin Street Department property (TW-17, TW-18, and TW-19). In the event that access is granted to 400 North Forsythe Street property, temporary well TW-25 will be eliminated and the locations proposed on the 400 North Forsythe Street property depicted on **Figure 2** will be utilized. In the event that access is granted to 600 North Forsythe Street property, temporary well TW-24 will be eliminated and the locations proposed on the 600 North Forsythe Street property depicted on **Figure 2** will be utilized.

IWM Consulting will consider groundwater samples obtained from monitoring well MW-9 as background dissolved VOC concentrations for the northern extent of the Study Area. Monitoring well MW-9 was groundwater sampled on October 25, 2018 and the results from that sampling event will be utilized as the background data associated with the Study Area.

The proposed boring and temporary well locations are displayed by location on **Figure 2** and **Figure 3**. Please note that these are proposed locations, are access dependent, and the final locations may have to be relocated in order to accommodate for subsurface, above ground structures/features (i.e. utilities), and/or ROW access limitations.

Soil borings will be advanced utilizing direct-push technology. The direct-push probe utilizes hydraulics to advance a sampler into the soil; consequently, excess soil cuttings are not generated

during direct-push drilling activities. Continuous soil samples will be obtained utilizing dual-tube sampling methods where a four-foot long acetate sleeve contained within a stainless-steel casing is advanced hydraulically to obtain the soil sample. Soil samples pass through the sampler cutting shoe and are retained within a sealed disposable acetate plastic sampling tube for retrieval. The acetate sleeve containing the soil sample is then removed while the stainless-steel outer casing remains in place. A new acetate sleeve is placed inside the casing for continued sampling and advancement of the borehole. Any soil cuttings generated will be placed in a labeled 55-gallon steel drum for characterization and future disposal. The drum will be stored near the existing groundwater treatment building located on the Site.

Strict decontamination procedures will be followed during the investigation activities by IWM Consulting personnel to reduce the potential for cross-contamination. Drilling and all non-disposable, down-hole sampling equipment will be decontaminated prior to first use on-site, and thereafter between uses, using a vigorous wash in Alconox solution, followed by a tap water and/or distilled water rinse. Any decontamination water generated will be temporarily placed in a 55-gallon steel drum, transported back to the Site, and then treated by the onsite groundwater remediation system, prior to discharging to the onsite sanitary sewer per the approved municipal discharge permit with the City of Franklin.

The soil samples collected will be field screened using a photo-ionization detector (PID) in an effort to determine the relative presence of adsorbed VOCs. The soil will also be visually examined and logged in general accordance with the Unified Soil Classification System (USCS). To ensure accurate VOC screening, the quantity of the soil, temperature, and headspace volume are kept as constant as possible. Prior to field activities, the PID will be calibrated in accordance with manufacturer's directions to minimize error through instrument drift. It should be noted that elevated PID readings are not always a reliable indicator of dissolved chlorinated solvent impacts. For this reason, the laboratory analytical results for the groundwater samples obtained from the temporary wells will most likely need to be received and evaluated prior to determining if any additional borings/temporary wells are necessary.

All of the borings will be advanced to the bottom of Unit B/top of Unit C and the depth where Unit C is encountered will be documented. The total depth of the borings is not anticipated to be greater than 24 feet bgs, but field observations will dictate the final depth of each boring. Temporary two-inch diameter polyvinyl chloride (PVC) screens, two-foot in length (with varying lengths of PVC risers), will be placed into the boreholes to facilitate the collection of the one-time groundwater samples from Unit B.

If it is determined that the saturated interval for Unit B is less than five feet thick, then only one temporary well will be installed at this location and the groundwater sampling interval will correspond to the top of the saturated zone (-1.75 feet of screen below the top of the observed saturated zone and -0.25 feet of screen above the top of the saturated zone). If the saturated interval for Unit B is determined to be greater than or equal to five feet thick, then a second, deeper temporary well will be installed adjacent to the shallower temporary well location. The deeper temporary well will have a

two-foot screen located at the base of the observed saturated zone (corresponding to the bottom of Unit B).

Although the groundwater sampling points are temporary, washed quartz (#5) sand will be installed within the borehole and extend approximately one foot above the top of the screen interval in an effort to assist in filtering any suspended sediment in the groundwater being sampled. The remaining borehole will be filled with bentonite in order to prevent surface water from entering into the borehole after the installation activities.

Following the installation of temporary wells, a professional survey will be completed in order to obtain ground surface and top of casing elevations and Ground Positioning System (GPS) coordinates (State Plan Coordinates based on NAD 83 Indiana State Plane Coordinate System, East Zone per Indiana Department of Transportation). This data will be incorporated with historic, recent, and newly obtained lithological data. This data will be utilized to determine the approximate topography of Unit C, and to evaluate if Unit C could be controlling the local groundwater flow direction.

Groundwater Sampling Activities

One-time groundwater samples will be obtained from the temporary wells a minimum of 24-hours after installation. A reasonable attempt will initially be made to obtain the groundwater samples from the temporary wells via low-flow sampling methods. If low-flow techniques are not possible (i.e. insufficient volume of water to allow for water to be drawn into the pump intake), the groundwater samples will be obtained from the temporary wells utilizing a bottom-loading, disposable, polyethylene bailer. If an insufficient amount of groundwater is recharging into the well during the initial purging activities, then the samples will be obtained with the bladder pump without obtaining any field readings after the temporary well has sufficiently recharged. Disposable tubing and/or bailers are utilized to minimize the risk of cross-contamination. Purge water generated during groundwater sampling activities will be temporarily containerized within a labeled 55-gallon DOT approved steel drum, transported back to the Site, and then treated by the onsite groundwater remediation system, prior to discharging to the onsite sanitary sewer per the approved municipal discharge permit with the City of Franklin.

A portable bladder pump in conjunction with a Horiba U-52 Multi-Probe Field Meter (or equivalent) will be used to collect groundwater samples from the temporary wells, if feasible. The pump is equipped with a disposable bladder sleeve that is exchanged between wells. Dedicated tubing will be used for each well. The Multi-Probe Field Meter includes probes for turbidity, temperature, pH, specific conductance, dissolved oxygen, and oxidation-reduction potential (ORP). Purge rates will be established at a rate that minimizes groundwater drawdown and the primary objective of the purging activities is to reduce the turbidity of the samples, as documented by a stable (±10%) or decreasing trend in turbidity.

Field parameters will be measured continuously, and groundwater samples will be collected after the turbidity has stabilized, after a maximum of 15 minutes of purge time, or once the temporary wells have been purged dry (and then allowed to sufficiently recharge), whichever occurs first. Care will

be taken to ensure the bladder pump discharge tubing and flow through cell have evacuated several volumes of water before the samples are obtained. Groundwater criteria which will be monitored during the purging activities are listed below:

- Turbidity — Nephelometric Turbidity Unit
- pH — pH units
- Specific Conductance — Siemens/meter or milli Siemens/centimeter
- Dissolved Oxygen — milligrams per liter
- ORP — millivolts

The groundwater samples will then be collected from the temporary wells and placed into the appropriate laboratory provided pre-labeled containers. The groundwater samples will be submitted to Pace Analytical Services, LLC located in Indianapolis, Indiana and analyzed for shortlist VOCs using SW-846 Method 8260 using Level IV Quality Assurance/Quality Control (QA/QC). The shortlist VOCs include the following compounds: vinyl chloride (VC), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethane (1,1-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), 1,2-dichloroethane (1,2-DCA), methylene chloride, 1,1,1-trichloroethane (1,1,1-TCA), trichloroethylene (TCE), and tetrachloroethylene (PCE). The laboratory results of the sampling event are anticipated to be received within 2 working days from the date the samples are collected in the field and delivered to the laboratory.

A table summarizing the Pace reporting and method detection limits for each compound compared to the MCLs and VISLs is provided below:

VOC Compound	Pace Laboratory Reporting Limits (ug/L)	Pace Laboratory Method Detection Limits (ug/L)	MCL (ug/L)	Target Groundwater Concentration for Residential VISLs (ug/L)
1,1-DCA	5.0	0.60	NA	7.6
1,2-DCA	5.0	0.60	5.0	2.2
cis-1,2- DCE	5.0	0.65	70	NA
trans-1,2-DCE	5.0	0.86	100	NA
Methylene Chloride	5.0	5.0	5.0	760
PCE	5.0	0.93	5.0	15
1,1,1-TCA	5.0	0.89	200	7,400
TCE	5.0	0.80	5.0	1.2
Vinyl Chloride	2.0	0.97	2.0	0.15

Assuming no dilutions are required by the laboratory, vinyl chloride is the only constituent that does not meet the VISL reporting requirement, however, the required reporting limit for the MCL will be met. The USEPA has previously agreed that this is acceptable, but has requested that Amphenol evaluate VI with soil gas sampling if the result is at or above the method detection limit.

To determine the Site-specific groundwater flow direction, the top-of-casing elevations for the temporary wells will be surveyed to a common benchmark using transit-stadia techniques and depth to groundwater measurements will be obtained from the existing groundwater monitoring wells (only monitoring wells screened within Unit B) and the newly installed temporary sampling points a

minimum of 24-hours after the temporary sampling points are installed. Once the sampling and subsequent groundwater gauging activities have been completed, the temporary wells will be removed and the boreholes will be backfilled with bentonite and the surface will be capped with like material (e.g., concrete, gravel, or topsoil) to match existing surface conditions in the area of the borehole.

Soil Sampling Activities

In addition to defining the lateral extent of dissolved phase VOCs in the Study Area, soil samples will be collected from select temporary well soil borings located along the western ROW of North Forsythe Street to determine if soil impacts potentially present within the sanitary sewer backfill material have migrated to the western extent of the ROW. This information is not required as part of the *Additional Off-site Groundwater Investigation Work Plan*, bu the data will assist in developing the *Off-site Interim Measure Work Plan.*

In order to characterize soils located between the ground surface and the top of the sanitary sewer line for future disposal or potential re-use during implementation of the *Off-Site Interim Measure Work Plan*, one soil sample will be collected from the one-foot interval located above the sanitary sewer line for laboratory analysis. It should be noted that elevated PID readings are not always a reliable indicator of adsorbed chlorinated solvent impacts, however, if a sample exhibits an elevated PID reading (greater than 5 parts per million vapor {ppmv}) from the surface to one-foot above the sanitary sewer line interval, an additional sample from the interval displaying the highest PID reading will also be selected for laboratory analysis. In order to assist in the development of the *Off-Site Interim Measure Work Plan*, additional soil samples will be collected from beneath the approximate depth of the sanitary sewer line in North Forsythe Street to characterize soils potentially impacted by chlorinated solvents released from breaks or cracks in the sanitary sewer line. Therefore, a second soil sample will be collected within approximately one-foot below the bottom of the sanitary sewer line, a third soil sample will be collected from the bottom one-foot of Unit B, and a fourth soil sample will be collected from the mid-point between the second and third sample intervals (if the thickness between the second and third sample intervals exceeds two feet). The soil data obtained from these borings will be utilized in conjunction with data obtained during the implementation of the *Design-Level Data Soil Investigation Work Plan.*

Soil samples will be analyzed for short list VOCs using SW-846 Method 8260 and percent moisture. Soil samples collected for laboratory analysis of VOCs will be obtained in general accordance with EPA Sampling Method 5035 using bulk TerraCore sampling supplies, including the 5-gram T-handle sampling device (or comparable).

A table summarizing the Pace reporting and method detection limits for each compound compared to Indiana Department of Environmental Management (IDEM) Remediation Closure Guide (RCG) screening levels is included on the table on the top of the following page:

VOC Compound	Pace Laboratory Reporting Limits (mg/kg)	Pace Laboratory Method Detection Limits (mg/kg)	IDEM RCG Soil Migration to Groundwater (mg/kg)	IDEM RCG Residential Direct Contact Screening Level (mg/kg)	IDEM RCG Commercial-Industrial Direct Screening Level (mg/kg)
1,1-DCA	0.005	0.0025	0.16	50	160
1,2-DCA	0.005	0.0025	0.028	6.4	20
cis-1,2- DCE	0.005	0.0025	0.41	220	2,300
trans-1,2-DCE	0.005	0.0025	0.62	1,900	1,900
Methylene Chloride	0.02	0.01	0.025	490	3,200
PCE	0.005	0.0014	0.045	110	170
1,1,1-TCA	0.005	0.0025	1.4	640	640
TCE	0.005	0.001	0.036	5.7	19
Vinyl Chloride	0.005	0.0025	0.014	0.83	17

Sample Identification, Collection, & Analysis

Field sample identification for this project should follow the following format: a sample location identification code (TW-15 for Temporary Well-15), a two-letter sample matrix code (GW for groundwater or SL for soil), and numbers designating the sampling interval of each sampling location. The trip blank, field duplicate, and equipment blank samples should utilize the identification codes TB, FD, and EB, respectively. Examples of the field sample identification codes for this project are as follows:

- For temporary well groundwater samples: TW-15 GW (14'- 16')
  (Temporary well sampling location No. 15 – groundwater sample, screen interval 14' – 16' bgs)
- For temporary well groundwater samples: TW-15 GW (20'- 22')
  (Temporary well sampling location No. 15 – groundwater sample, screen interval 20' – 22' bgs)
- For temporary well soil samples: TW-15 SL (8' – 10')
  (Temporary well sampling location No. 15 – soil sample, interval 8' – 10' bgs)
- For temporary well groundwater field duplicate samples: FD-1 GW
  (Groundwater sample field duplicate No. 1)
- For temporary well soil field duplicate samples: FD-1 SL
  (Soil sample field duplicate No. 1)
  Note that no sampling location identification is utilized for the field duplicate. The field duplicate location/sampling identification information is to be recorded in the field project notebook.
- For equipment blank groundwater samples: EB-1 GW
  (Equipment Blank - groundwater sample No. 1)
- For equipment blank soil samples: EB-1 SL
  (Equipment Blank - soil sample No. 1)
- For trip blank groundwater samples: TB-1 GW
  (Trip Blank – groundwater sample No. 1)

Standard protocols will be observed for sample collection, sample handling and preservation, and chain-of-custody (COC) documentation. Personnel will utilize clean, disposable, nitrile gloves for each sample obtained. Laboratory provided sample containers will be utilized. Prior to use, the sample containers will be inspected for cracks, chips, cleanliness, and preservative (as appropriate). Container threads will be wiped clean before sealing (if applicable) to ensure proper sealing. The sample containers will be labeled with the appropriate project name and/or number, sample identification designation, date, time, and sampler's name or initials. Samples will be placed in a cooler containing ice and maintained at a temperature of approximately 4° Celsius prior to analysis.

Samples will be analyzed by the laboratory using a 48-hour turnaround time (TAT) and Level IV QA/QC procedures. Depending on approval of off-site access, IWM Consulting anticipates obtaining a minimum of eleven (11) to twenty-three (23) groundwater samples and twelve (12) to twenty (20) soil samples which will be collected from the temporary wells/borings for select VOC analysis. Additional groundwater samples may be collected if the saturated portion of Unit B is found to be greater than or equal to five feet thick. Additional soil samples may be collected if a sample exhibits an elevated PID reading (greater than 5 ppmv) from the surface to one-foot above the sanitary sewer line interval or fewer soil samples could be collected if the thickness between the second and third soil sample intervals are less than two feet thick. For QA/QC purposes, one (1) field duplicate will be collected at a rate of one (1) sample per every ten (10) confirmatory samples per sampling media and will be analyzed for the same analytical parameters. In addition, one (1) matrix spike/matrix spike duplicate (MS/MSD) sample will be collected at a rate of one (1) sample per every twenty (20) samples per sampling media and will be analyzed for the same analytical parameters. One (1) trip blank for VOC analysis will accompany each cooler shipment that contains samples for select VOC analyses. One (1) equipment blank per sampling media per day will be obtained. The equipment blank will be collected by pouring laboratory-prepared water or distilled water over or through the field sampling equipment (e.g., the cutting shoe or bladder pump) and collecting the rinsate in the proper analytical containers. If only disposable or single use sampling equipment is used, then a field blank, consisting of analyte-free water poured into a laboratory provided container in the field (in order to assess the potential for sample contamination due to field conditions) will be collected in lieu of an equipment blank.

The applicable Standard Operating Procedures (SOPs) which will be followed by IWM Consulting during the groundwater sampling, Pace COC, pertinent information such as laboratory certifications for Pace, and USEPA RSLs for this project were previously submitted and conditionally approved by the USEPA during the implementation of the *Off-site Groundwater Investigation Work Plan* (Attachment B) dated October 18, 2018. However, the applicable SOPs which will be followed by IWM Consulting during the soil sampling activities are provided as **Attachment B**.

Reporting

Preliminary results, including a copy of the laboratory report, a site map displaying the final sampling locations, and a table summarizing the results, will be supplied to representatives from the USEPA as soon as possible once the information has been received and reviewed. The groundwater analytical results will be compared to the USEPA VISLs and MCLs and a brief letter report will also be generated

and submitted to the USEPA. The letter report will summarize the sampling activities, the estimated topography of Unit C, analytical results, and make recommendations regarding the need for additional sampling or investigation activities, if warranted. Prior to submission of the final letter report, the analytical results will be validated by a third-party data validation firm and the validation report will be included within the letter report being submitted to the USEPA.

Timeline

The table below is the estimated timeline associated with implementing this Work Plan.

Task	Anticipated Estimated Completion Date	Comments
Submittal of Draft Work Plan	January 18, 2019	
Receipt of USEPA Comments	February 6, 2019	Receipt of USEPA comments via email and teleconference on Draft Work Plan
Submittal of Work Plan	February 13, 2019	
USEPA Conditional Approval of the Work Plan	Mid to Late-February 2019	
Installation of Primary Soil Borings per *Design-Level Data Soil Investigation Work Plan*	February 25 through February 28, 2019	Based on USEPA approval, weather, receipt of site access/ROW permits, and subcontractor availability
Installation of Temporary Wells	March 1 through March 6, 2019	Based on USEPA approval, weather, receipt of site access/ROW permits, and subcontractor availability – if off-site access is granted at a later date, a second mobilization may be required.
Installation of Secondary Soil Borings per *Design-Level Data Soil Investigation Work Plan*, if necessary	March 7 through March 8, 2019	Based on USEPA approval, weather, receipt of site access/ROW permits, and subcontractor availability
Conduct Low Flow Groundwater Sampling Activities for Newly Installed Temporary Wells	Early to Mid-March 2019	Initiated a minimum of 24-hours after the installation activities and completed within within 1-week of the installation activities, weather permitting
Groundwater Gauging	Early- to Mid-March 2019	Gauging of all temporary wells and entire monitoring well network, minimum 24-hours after installation of the temporary wells
Survey of temporary well top of casings	Early-to Mid-March 2019	Survey completed by licensed surveyor, based on subcontractor availability
Receipt of Preliminary Laboratory Analytical Results	Mid-March 2019	Expedited analysis required, anticipate within 48 to 72 hours of sampling event
Submittal of Preliminary Laboratory Results to the USEPA	Late-March 2019	
Well Abandonment	Late-March 2019	Abandonment of temporary wells.
Submittal of Letter Report to the USEPA	May 2019	

Please do not hesitate to contact the undersigned with questions or if you need additional information regarding this submittal.

Sincerely,

IWM CONSULTING GROUP, LLC

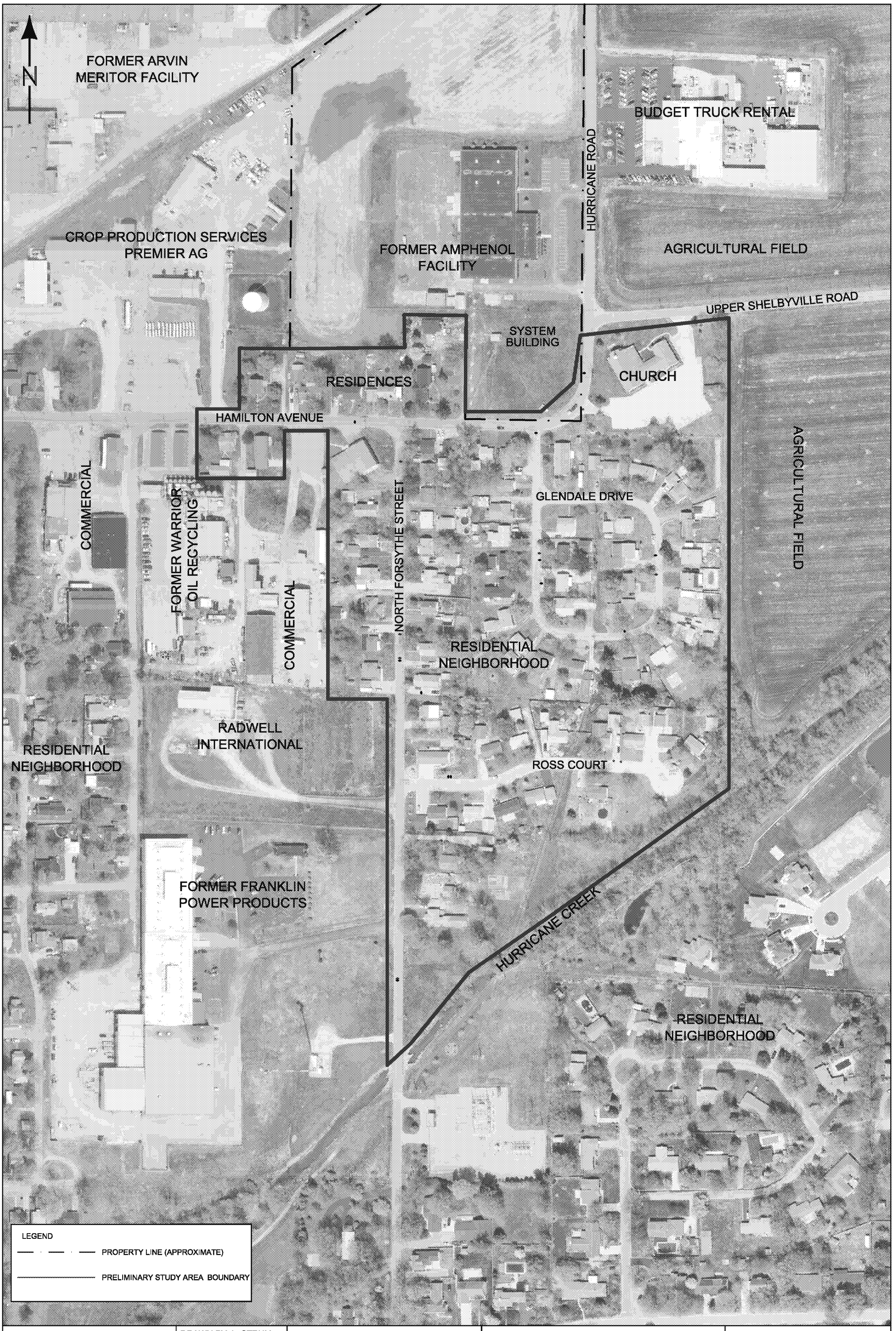
Christopher D. Parks, LPG #2169
Senior Project Manager

Bradley E. Gentry, LPG #2165
Vice President/Brownfield Coordinator

cc: Mr. Joseph Bianchi, Amphenol (electronic only)
Bhooma Sundar, U.S. EPA Region 5, RRB CAS2 (electronic only)
Conor Neal, U.S. EPA Region 5, RRB CAS2 (electronic only)

Attachments

Figures



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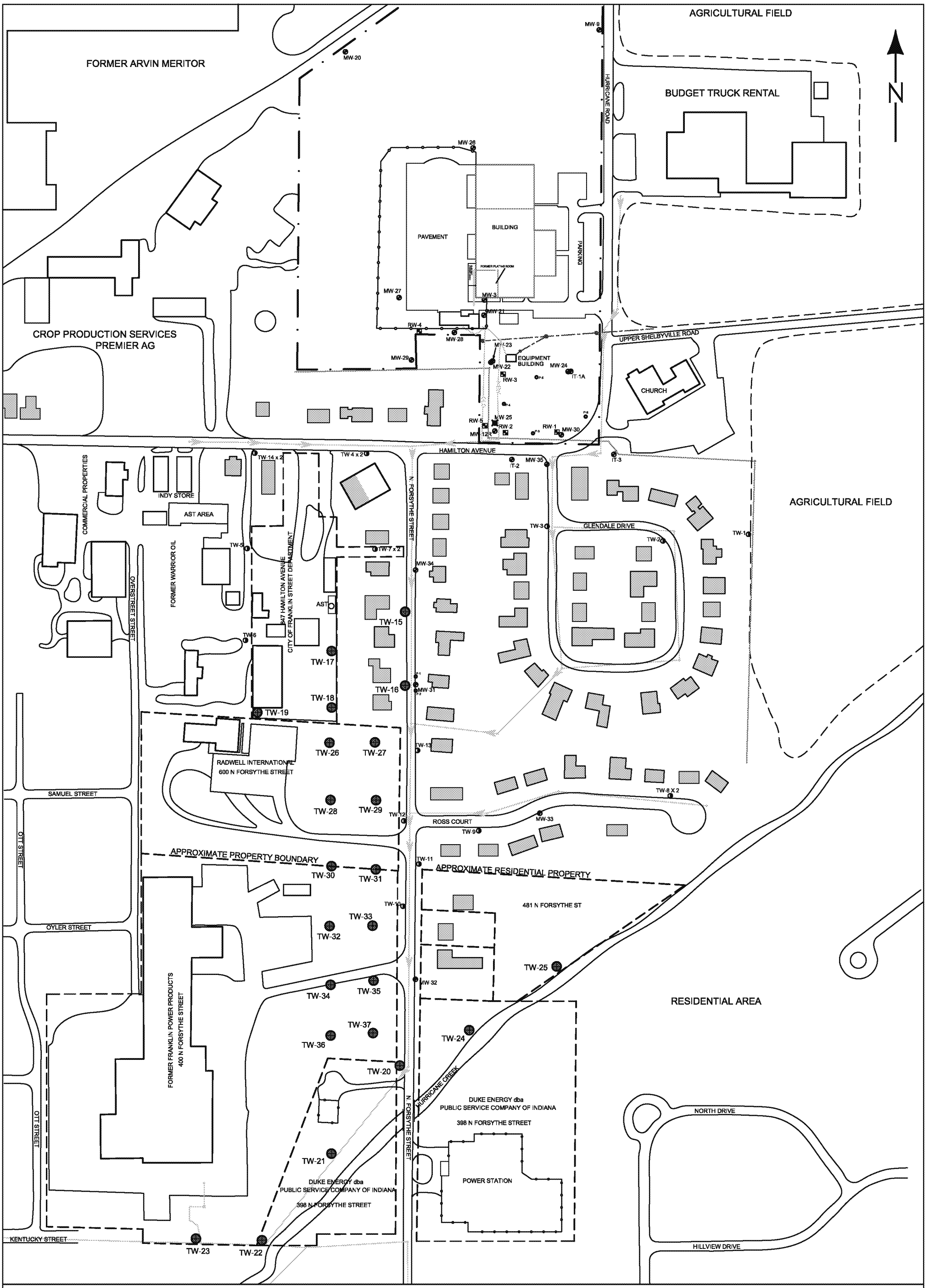
DRAWN BY: L. STRUM	
DATE: 9/27/99	
REVISED: 09/10/2018	
HWPA #111291-01	
DWG. NO. 111291S1	

FIGURE 1
PRELIMINARY STUDY AREA MAP

FORMER AMPHENOL RFI/CMS
980 HURRICANE ROAD
FRANKLIN, INDIANA

IWM CONSULTING GROUP



LEGEND

- ABANDONED MONITORING WELL
- MONITORING WELL
- RECOVERY WELL
- PIEZOMETERS
- TEMPORARY WELLS
- PROPERTY LINE (APPROXIMATE)
- STORM SEWER
- SANITARY SEWER
- O/H POWER
- RESIDENTIAL HOME * DETACHED GARAGES & SHEDS NOT SHOWN
- NON-RESIDENTIAL STRUCTURE
- PRIMARY BUILDING WALLS
- PROPOSED SOIL BORING/ TEMPORARY MONITORING WELL

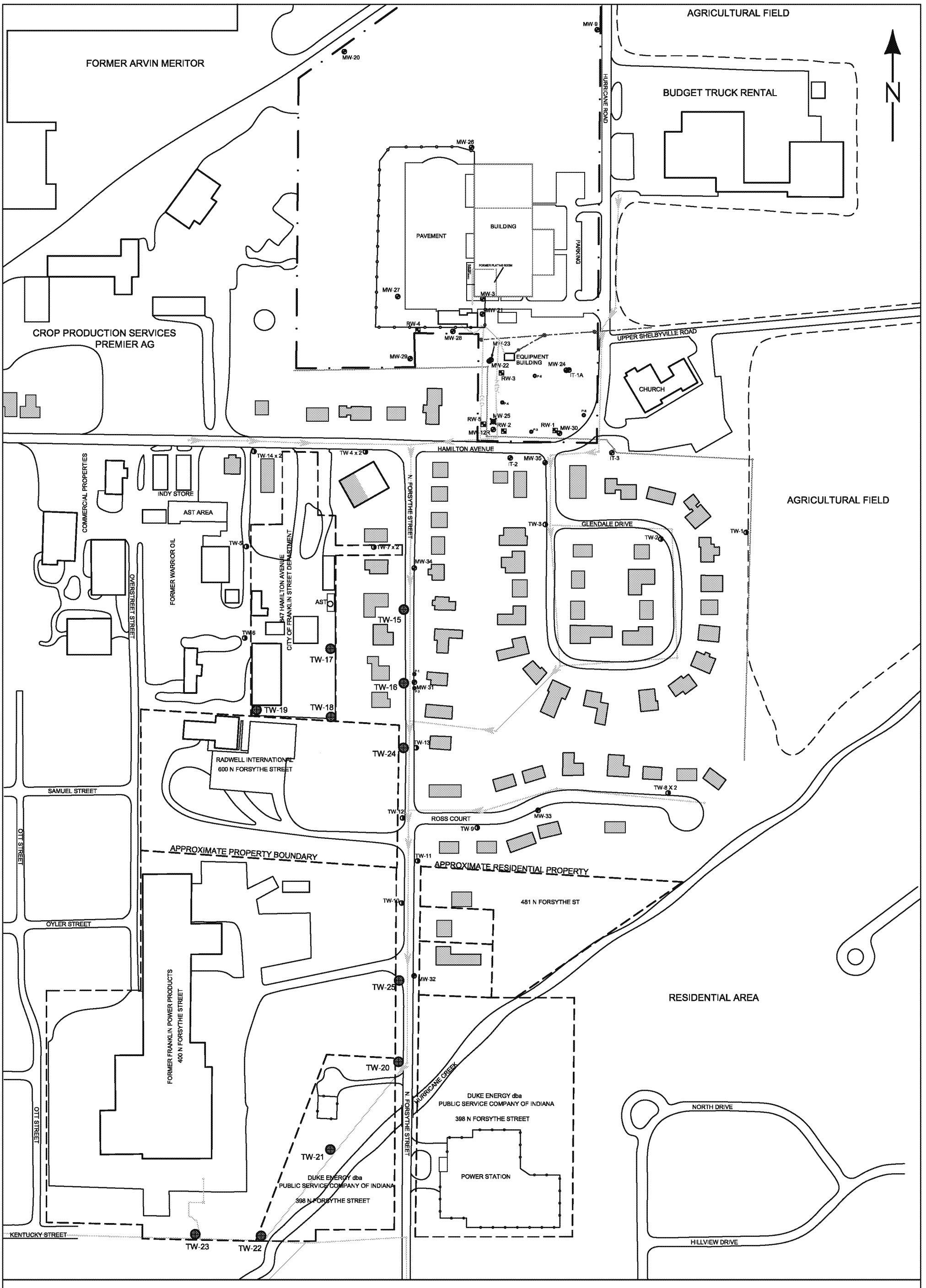
0' 200'
SCALE IN FEET

DRAWN BY: L. STRUM	
DATE: 9/27/99	
REVISED: 01/31/2019	
HWPA #111291-01	
DWG. NO. 111291S1	

FIGURE 2
PROPOSED TEMPORARY WELL LOCATION MAP
(IF OFF-SITE ACCESS GRANTED)

FORMER AMPHENOL RFI/CMS
980 HURRICANE ROAD
FRANKLIN, INDIANA

IWM CONSULTING GROUP



0' 200'
SCALE IN FEET

DRAWN BY: L. STRUM	
DATE: 9/27/99	
REVISED: 01/31/2019	
HWPA #111291-01	
DWG. NO. 111291S1	

FIGURE 3
PROPOSED TEMPORARY WELL LOCATION MAP
(IF OFF-SITE ACCESS DENIED)

FORMER AMPHENOL RFI/CMS
980 HURRICANE ROAD
FRANKLIN, INDIANA

iWM CONSULTING GROUP

Attachments

Attachment A

USEPA Letter Dated December 11, 2018
And
E-Mail from USEPA dated December 19, 2018

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF LU-16J

Via E-mail and Certified Mail 7014 2870 0001 9579 3838
RETURN RECEIPT REQUESTED

December 11, 2018

Mr. Joseph M. Bianchi
Group EHS Manager
Amphenol Corporation
40-60 Delaware Avenue
Sidney, NY 13838

Subject: Additional Off-site Groundwater Investigation, Request for Work Plan
Franklin Power Products, Inc./Amphenol Corporation
Administrative Order on Consent, Docket # R8H-5-99-00
EPA ID# IND 044 587 848

Dear Mr. Bianchi:

EPA has reviewed the off-site groundwater data collected under the *Off-site Groundwater Investigation Work Plan Franklin Power Products, Inc./Amphenol Corporation*, dated October 18, 2018 (October Work Plan). This is a request for Amphenol to collect additional information on the off-site groundwater plume. Please provide an extended study work plan designed to collect the information described below. The extended study work plan must incorporate the comments and conditions from EPA's October 23, 2018 conditional approval letter of the October Work Plan. The work plan is due by December 20, 2018.

1) There is some evidence that the C-Unit confining layer could be controlling local groundwater flow direction. Based on CMS borings PGP-6 and PGP-7, there appears to be a significant decrease in elevation of the top of the confining layer west of Forsythe St. Additional information is needed to determine whether this is the case. In addition, the topography of the C-Unit is undefined to the east.

   Please prepare a map showing the elevation of the top of C-Unit using all available data from monitoring wells, temporary well borings, and other soil borings, including data collected during the RFI and CMS (some sample locations are labelled PGP, SGP, etc.). This map will help determine where the confining layer may be influencing control on local groundwater flow directions.

2) The western extent of groundwater contamination has not been delineated to VISLs or MCLs.

   Amphenol must collect additional groundwater samples in the area west of North Forsythe St. wells TW-10, TW- 11, TW-12, TW-13, MW-31, and MW-32. Additional groundwater samples should also be collected in the area South of Ross Ct, East of Forsythe St, and North of Hurricane Creek.

   Please provide an interim sample location figure to EPA for discussion in advance of the final work plan proposal. Upon receipt and review, EPA will work with you to identify the final sample locations for this event.

If data from this round of sampling report potential confounding sources in the western and southern area, EPA will discuss forensic approaches with Amphenol.

If you have any questions, please contact me at (312) 886-3020. Also, please feel free to contact Conor Neal, EPA hydrogeologist, at (312) 886-7193 with any questions.

Sincerely,

Carolyn Bury

Carolyn Bury
Project Manager
Corrective Action Section 2
Remediation and Re-use Branch

cc: Matt Kupcak, BorgWarner, Inc. Certified Mail 7009 1680 0000 7621 2378

ecc: Brad Gentry, IWM Consulting Group, LLC.
Bhooma Sundar, RRB CAS2
Conor Neal, RRB CAS2
Motria Caudill, ATSDR
Don Stilz, IDEM

Brad Gentry

From: Bury, Carolyn <bury.carolyn@epa.gov>
Sent: Wednesday, December 19, 2018 8:43 AM
To: Joe Bianchi (jbian@amphenol-aao.com)
Cc: Brad Gentry; Neal, Conor; Sundar, Bhooma
Subject: Revised deadline, Extended Study GW Plume
Attachments: Amphenol GW Request for Additional Investigation 12-11-18.docx.pdf

Hi Joe,

Per our call yesterday, an incorrect date was provided for the due date for the attached work plan to further define the GW plume at Amphenol. The due date should have read Jan 20, 2018 rather than Dec 20, 2018.

Please let me know if you prefer this notification formally, in a letter.

Thanks.

Carolyn

Carolyn Bury
Corrective Action Project Manager
Remediation and Re-use Branch
Land and Chemicals Division
U.S. Environmental Protection Agency
77 W. Jackson Blvd. LU-16J
Chicago, IL 60604

312-886-3020
bury.carolyn@epa.gov

Attachment B

IWM Consulting SOPs

SOP Group G

Standard Operating Procedures for Soil Sampling

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SOP Group G

Standard Operating Procedures for Soil Sampling

Introduction

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report. Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

SOP G.1 Method Summary

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled by hand or using a spade, trowel, or scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a split-spoon, or, if required, a drill rig, direct-push sampler or, a backhoe or excavator bucket.

SOP G.2 Sampling Preservation, Containers, Handling and Storage

Chemical preservation of solids is based on analytical method requirements. Samples should be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected, proper sample container type and preservative are discussed in SOP Group H.

SOP G.3 Interference and Potential Problems

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the

matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

SOP G.4 Equipment

Typical soil sampling equipment includes some or all of the following:

- Maps/plot plan
- Safety equipment (including PPE), as specified in the site-specific Health and Safety Plan
- Survey equipment or global positioning system (GPS) to locate sampling points
- Tape measure
- Survey stakes or flags
- Camera and film
- Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Site logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Decontamination supplies/equipment
- Canvas or plastic sheet
- Spade or shovel
- Spatula
- Scoop
- Plastic or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Drill rig or direct-push sampler
- Split spoons
- Vehimeyer soil sampler outfit
- Backhoe

SOP G.5 Reagents

When obtaining soil samples for VOC analysis, the soil samples must be obtained in accordance with Sampling Method 5035. Consequently, Terra Core™ sampling Kits will need to be utilized during the sampling activities. The Terra Core™ Sampling Kits include two pre-weighed (tared) and labeled 40-mL VOA glass vial containing a magnetic stir bar and 5-mL of reagent (distilled) water. These containers will be utilized for low level VOC samples. The kits also include one pre-weighed and labeled 40-mL VOA glass vial containing 5-mL of MeOH for medium to high level VOC samples. Avoid splashing any preservative, if present, out of the sample container by holding the container at an angle while slowly extruding the soil core into the sample container. Do not immerse the sampling device into the preservative.

Reagents are not typically used for the preservation of non-volatile soil samples.

SOP G.6 Procedures

G.6.1 Preparation

Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.

Obtain project-specific sampling objectives from the Project Manager.

Obtain necessary sampling and monitoring equipment.

Decontaminate or pre-clean equipment, and ensure that it is in working order.

Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.

Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

Use stakes, flagging, or spray paint to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, utilities, and surface obstructions. All staked locations should be utility-cleared by the property owner or the Field Team Leader prior to soil sampling; and utility clearance should always be confirmed before beginning work.

G.6.2 Sample Collection

G.6.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:

Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.

Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.

If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container using a T-handle sampler in accordance with sampling Method 5035. This procedure is discussed in more detail in Section G.6.2.6 of this SOP. The VOC samples must be first set of sample containers filled during the sampling event. If additional non-volatile sampling parameters are required, mix the remaining soil well and fill the sampling containers in a manner that allows for the most volatile samples (i.e. SVOCs) to obtained first, followed by less volatile samples (i.e. metals or PCBs). If a composite soil sample is required across one particular sampling interval, place the remainder of the sample into a stainless steel, plastic, dedicated sealable bag, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, place the sample into appropriate, labeled containers and secure the caps tightly. If composite samples are to be collected from more than one sampling interval or location, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

G.6.2.2 Sampling at Depth with Augers

This system consists of an auger and a series of extensions, and a "T" handle. The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. The system is then lowered down the borehole, and

driven into the soil to the completion depth. The system is withdrawn and the sample is collected from within the auger bucket.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1) Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.

2) Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.

3) Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4) After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole. Without disturbing the soil sample, scan the collected interval (directly from bucket of the auger) using a PID or and FID. Record the findings and lithological description of the soil in the field book.

5) **If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container using a T-handle sampler, in accordance with sampling Method 5035. This procedure is discussed in more detail in Section G.6.2.6 of this SOP. The VOC samples must be first set of sample containers filled during the sampling event.** If additional non-volatile sampling parameters are required, mix the remaining soil well and fill the sampling containers in a manner that allows for the most volatile samples (i.e. SVOCs) to obtained first, followed by less volatile samples (i.e. metals or PCBs). If a composite soil sample is required across one particular sampling interval, place the remainder of the sample into a stainless steel, plastic, dedicated sealable bag, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, place the sample into appropriate, labeled containers and secure the caps tightly. If composite samples are to be collected from more than one sampling interval or location, place a sample from another sampling interval or location into the homogenization container and mix thoroughly.

When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

6) If another sample is to be collected in the same hole, but at a greater depth, remove any excess soil from the auger bucket, and follow steps 3 through 6, making sure to decontaminate the auger and tube sampler between samples.

7) Record any additional information, such as sample depth, location, soil type, etc. Abandon the borehole according to applicable state regulations. Generally, shallow excavations can simply be backfilled with bentonite and capped at the surface with like material (i.e. topsoil, gravel, pavement, or concrete).

G.6.2.3 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1) Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.

2) Place the sampler in a perpendicular position on the sample material.

3) Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.

4) Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.

5) Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.

6) Without disturbing the soil sample, scan the collected interval (directly from the split spoon) using a PID or and FID. Record the findings and lithological description of the soil in the field book and select the sample displaying the highest field screen reading, and/or from other areas that indicate the potential for contamination. Be certain to understand the project specific objective and sampling rationale prior to determining your sampling interval.

7) Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly. **If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container using a T-handle sampler in accordance with sampling Method 5035. This procedure is discussed in more detail in Section G.6.2.6 of this SOP. The VOC samples must be first set of sample containers filled during the sampling event.** If additional non-volatile sampling parameters are required, mix the remaining soil well and fill the sampling containers in a manner that allows for the most volatile samples (i.e. SVOCs) to obtained first, followed by less volatile samples (i.e. metals or PCBs). If a composite soil sample is required across one particular sampling interval, place the remainder of the sample into a stainless steel, plastic, dedicated sealable bag, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, place the sample into appropriate, labeled containers and secure the caps tightly. If composite samples are to be collected from more than one sampling interval or location, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

8) Record any additional information, such as sample depth, location, soil type, etc. Abandon the borehole according to applicable state regulations. Generally, shallow excavations can simply be backfilled with bentonite and capped at the surface with like material (i.e. topsoil, gravel, pavement, or concrete).

G.6.2.4 Sampling at Depth Using a Direct-Push Sampler

Direct-push soil sampling is accomplished using an impact-driven or truck-mounted Geoprobe® or EarthProbe® type drill rig equipped with a probe-drive, soil-sampling system. Soil samples are retrieved by hydraulically driving a sampling probe rod to the desired depth. Depending on the type of system employed, the samplers may either take continuous samples or the probe rod may be used to obtain samples at discrete intervals. The sample remains sealed within an inner clear-PVC sample tube, contained in the sampling probe as it is driven to the desired depth. As the probe is driven through the desired sampling interval, the soil sample is forced upward past a cutting shoe on the end of the drive rod. As the soil passes upwards, it enters a disposable, clear-PVC liner attached to the cutting shoe. Soil samples retrieved in this manner can be characterized for texture, moisture content, color, etc., and selected samples can be retained for laboratory analysis.

The following procedures are used for collecting soil samples with a direct-push sampler:

1) After driving the sampler through the sample interval the probe rods and/or sampler is extracted from the borehole.

2) The cutting shoe is removed allowing for the removal of the clear-plastic liner containing the sample.

3) Place the sampler liner horizontally on a clean working surface (e.g., a plastic table). Record in the site logbook or on field data sheets the length of the sample interval, the sample recovery, and any other pertinent information and observations.

4) Utilize a clean, box-cutter style knife blade to open the plastic sampling tube lengthwise.

Note: occasionally some work plans may not call for cutting the sampling tube lengthwise and instead will call for the cutting of one or more perpendicular segments from sampling tube, which will then have the ends capped and sealed with the sample remaining intact and undisturbed within the selected section of sample liner.

5) Without disturbing the soil sample, scan the collected interval (directly from acetate liner) using a PID or an FID. Record the findings and lithological description of the soil in the field book and select the sample displaying the highest field screen reading, and/or from other areas that indicate the potential for contamination. Be certain to understand the project specific objective and sampling rationale prior to determining your sampling interval.

6) **If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container using a T-handle sampler, in accordance with sampling Method 5035. This procedure is discussed in more detail in Section G.6.2.6 of this SOP. The VOC samples must be first set of sample containers filled during the sampling event.** If additional non-volatile sampling parameters are required, mix the remaining soil well and fill the sampling containers in a manner that allows for the most volatile samples (i.e. SVOCs) to obtained first, followed by less volatile samples (i.e. metals or PCBs). If a composite soil sample is required across one particular sampling interval, place the remainder of the sample into a stainless steel, plastic, dedicated sealable bag, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, place the sample into appropriate, labeled containers and secure the caps tightly. If composite samples are to be collected from more than one sampling interval or location, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7) Record any additional information, such as sample depth, location, soil type, etc. Abandon the borehole according to applicable state regulations. Generally, shallow excavations can simply be backfilled with bentonite and capped at the surface with like material (i.e. topsoil, gravel, pavement, or concrete).

G.6.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examinations of soil characteristics are required.

The following procedures are used for collecting soil samples from test pits or trenches:

1) Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.

2) Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3) Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

4) Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

5) **If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container using a T-handle sampler, in accordance with sampling Method 5035. This procedure is discussed in more detail in Section G.6.2.6 of this SOP. The VOC samples must be first set of sample containers filled during the sampling event.** If additional non-volatile sampling parameters are required, mix the remaining soil well and fill the sampling containers in a manner that allows for the most volatile samples (i.e. SVOCs) to obtained first, followed by less volatile samples (i.e. metals or PCBs). If a composite soil sample is required across one particular sampling interval, place the remainder of the sample into a stainless steel, plastic, dedicated sealable bag, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, place the sample into appropriate, labeled containers and secure the caps tightly. If composite samples are to be collected from more than one sampling interval or location, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

6) Record any additional information, such as sample depth, location, soil type, etc. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

G.6.2.6 Terra Core™ Sampling Kit (VOC Soil Sampling)

Terra Core™ Sampling Kit: When obtaining soil samples for volatile organic compound (VOC) analysis, the samples must be obtained using a Terra Core™ Sampling Kit. The Terra Core™ Sampling Kit contains the following:

- Two pre-weighed (tared) and labeled 40-mL VOA glass vial containing a magnetic stir bar and 5-mL of reagent (distilled) water. These containers will be utilized for low level VOC samples.
- One pre-weighed and labeled 40-mL VOA glass vial containing 5-mL of MeOH for medium to high level VOC samples.
- One empty, non-preserved, pre-weighed and labeled 40-mL VOA glass vial for percent moisture analysis.
- One, disposal Terra Core™ T-handle plunger, which is designed to obtain a 5-gram plug of soil. The T-handle plunger is a disposable transfer tool, designed to easily take samples from hard packed soils and transfer them to the appropriate containers for in-field chemical preservation. The Terra Core™ T-handle transfers soil samples as described in USEPA SW-846 Method 5035. The one T-handle plunger can be used to transfer all of the 5-gram soil plugs into the appropriate sample containers for that particular sampling interval. However, a new T-handle plunger must be utilized for any samples obtained for laboratory analysis from a different sampling interval.

All volatile soil samples, regardless of sampling technique and sample depth, must be collected and transferred to the Terra Core™ sampling containers using the T-handle as soon as possible from the undisturbed sample (ideally within 5 minutes) after the undisturbed soil sample is collected. Under no circumstance can undisturbed soil samples which have already been transferred from the core sampler or sampling device (i.e. bucket of the excavator) to a secondary container (empty sample bottle, sealable plastic bag, aluminum foil, or sampling/mixing bowls) be utilized for VOC laboratory sample collection.

The steps for use of the Terra Core™ Sampling Kit are as follows:

1) Have ready a tared 40ml glass VOA vial ready (the tarred vials will be pre-weighed by the laboratory prior to use and the pre-sample weights will already be recorded on the sample label). With the plunger seated in the handle, push the Terra Core into freshly exposed soil until the sample chamber is filled. A filled chamber will deliver approximately 5 grams of soil.

2) Wipe all soil or debris from the outside of the Terra Core™ sampler. The soil plug should be flush with the mouth of the sampler. Remove any excess soil that extends beyond the mouth of the sampler.

3) Immediately open the sample container and extrude the soil core into the sample container that will be submitted to the laboratory. Rotate the plunger that was seated in the handle top 90° until it is aligned with the slots in the body. Place the mouth of the sampler into the tared 40ml VOA vial containing the appropriate preservative, and extrude the sample by pushing the plunger down. Avoid splashing any preservative, if present, out of the sample container by holding the container at an angle while slowly extruding the soil core into the sample container. Do not immerse the sampling device into the preservative.

4) Quickly place the lid back on the tared 40ml VOA vial.

5) Fill the sample containers in the following order: low level (distilled water with a magnetic stir bar) first, medium to high level (methanol preserved) second, and percent moisture last.

Note: When capping the 40ml VOA vial, be sure to remove any soil or debris from the threads of the vial.

6) Ensure that all of the pertinent sampling information (sample ID, depth, sample date and time, etc.) is recorded on the sample label and in the field book. Place the filled and labeled sample container into a baggie for preservation in an ice filled cooler.

Note: If the tarred VOA vials are unpreserved. The sample method requires that the samples are to be cooled to 4°C and preserved at the lab within 48 hours of collection.

G.6.2.7 Non-VOC Soil Sample Collection

Following the collection of VOC soil samples, any analysis required that does not require the preservation of volatiles will follow this method:

1) Have ready the appropriate sample containers (e.g. 2 or 4 oz jars).
2) Mix the remaining soil well and fill the sample container and close the sample container with the supplied lid.
3) Clean any excess soil from the outside of the sample container and apply the completed sample container label.
4) Place the filled and labeled sample container into a baggie for preservation in an ice filled cooler.
5) If composite samples are being obtained, place a representative mixture of soil from the sample interval into a baggie and mix thoroughly by hand. This should adequately mix the sample to obtain a representative sample from the entire sample interval for Non-VOC laboratory analysis.
6) Fill the sample container from the soils within the baggie and close the sample container with the supplied lid.

7) Clean any excess soil from the outside of the sample container and apply the completed sample container label.
8) Place the filled and labeled sample container into a baggie for preservation in an ice filled cooler.

It should be noted that all non-volatile soil samples can only be obtained **after** the VOC soil sampling activities have been completed.

SOP G.7 Quality Assurance/Quality Control

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

SOP G.8 Health and Safety

When working with potentially hazardous materials, follow the site specific Health & Safety Plan.

SOP G.9 References

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Technique and Strategies. EPA-600/4-83-020. Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043.

U.S. Environmental Protection Agency. 1984 Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA-600/4-84-076.
de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-011.

ASTM D 1586-98, ASTM Committee on Standards, Philadelphia, PA.

SOP Group H
Standard Operating Procedures
For Sample Preservation, Storage, Handling and Field COC Documentation

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SOP Group H
Standard Operating Procedures
For Sample Preservation, Storage, Handling and Field COC Documentation

Introduction

The purpose of this Standard Operating Procedure (SOP) is to provide general guidelines for the preservation, storage, and handling of water and soil/sediment samples. Requirements for sample volume, matrix spike/matrix spike duplicate (MS/MSD) sample volume, container type, and preservation techniques for sample preservation, storage, and handling must be established in the work plan prior to sample collection.

The methods described in this SOP are typically applicable operating procedures which may be varied or changed as required, dependent upon site conditions or equipment limitations. In all instances, the procedures employed should be documented in the site logbook and associated with the final report.

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

SOP H.1 METHOD SUMMARY

Proper techniques of preserving, storing, and handling water and soil/sediment samples are critical if the integrity of the samples are to be maintained. This SOP is applicable to all water and soil/sediment samples collected in Indiana.

SOP H.2 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

SOP H.2.1 Sample Preservation and Storage

Samples should be collected using equipment and procedures appropriate to the matrix, the parameters to be analyzed, and the sampling objective. The volume of the sample collected must be sufficient to perform the analysis requested, as well as the quality assurance/quality control requirements.

Table 1 contains examples of parameters which are typically of interest in environmental site investigations and indicates the required sample volume, the proper types of containers, and the preservation method for water and soil/sediment samples. Note that the majority of the samples must be cooled to $\leq 4^{\circ}C$ from the time of collection until analysis. Table 1 provides an example of typical sample volumes, container types, and preservation methods but these items should be verified with the laboratory before ordering and obtaining the samples.

Depending on the arrangements for sample analysis and the amount of sample required for the analysis, it is possible that aliquots for several analyses may be taken from the same sample container. This should be verified with the laboratory performing the analyses prior to sample collection.

All sample containers must be clean and labeled appropriately. The exterior of the sample containers must be wiped clean and dry prior to sample packaging. All samples must be packaged according to the requirements of U.S. Environmental Protection Agency (USEPA) or Indiana Department of Environmental Management (IDEM).

For more information regarding water and soil/sediment sample collection, refer to the Procedures section of the appropriate SOP. Sample containers must not be pre-rinsed with the sample prior to sample collection. When a preservative other than cooling is used, the proper amount of preservative should already be present in the laboratory-supplied containers.

The laboratory performing the analysis should be contacted to confirm the requirements for sample volumes, container types, and preservation techniques. This information should be documented in the work plan.

SOP H.2.2 Chain-of-Custody Procedures

In some instances, it may be necessary to prove any analytical data offered into evidence accurately represent environmental conditions existing at the time of sample collection. Due to the evidentiary nature of such samples, possession must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. It must be clearly demonstrated that none of the involved samples could have been tampered with during collection, transfer, storage, or analysis.

To maintain and document sample possession, the following chain-of-custody procedures are followed:

SOP H.2.2.1 Sample custody

A sample is under custody if: a) It is in your possession, or b) It is in your view, after being in your possession, or c) It was in your possession and then you locked it up or placed it in a sealed container to prevent tampering, or d) It is in a designated secure area.

SOP H.2.2.2 Field custody

a) Advise laboratory personnel at the time a decision is made that a sample requiring a chain-of-custody record is going to be collected. Specify the data and time that it will arrive in the laboratory. In instances where it is not known in advance of field trip, the laboratory should be notified as soon as possible about the arrival of such samplers.

b) In collecting samples for evidence, collect only that number which provides a good representation of the medium being sampled. To the extent possible, the quantity and type of samples and sample locations are determined prior to the actual field work. As few people as possible should handle the samples.

c) The samples must be collected in accordance with required and established methods.

SOP H.2.2.3 Transfer of custody and shipment

a) To establish the documentation necessary to trace sample possession, a Chain-of-Custody Record (Figure 1) must be filled out and accompany each set of samples. The record should accompany the samples to the laboratory. This record documents sample custody transfer from the sampler to the analyst at the laboratory. At a minimum, the record should contain: the sampling location or sample identification; the signature of the collector; the date and time of collection; place and address of collection; substance sample; signature of persons involved in the chain of possession; and, inclusive dates of possession.

b) Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis. The samples for each shipping container should be placed in a large plastic bag and should be sealed with a paper seal to indicate for possible tampering.

c) Each transfer of sample custody must be documented on the Chain-of-Custody Record; however, when the sample is to be sealed for shipment, the word "sealed" should be written after the collector's signature. Then received in the laboratory, the word "sealed" should be written after the recipient's signature if no tampering has occurred.

d) All shipments will be accompanied by the Chain-of-Custody Record identifying its contents. The original record will accompany the shipment, and a copy will be retained by the project leader.

e) The laboratory should have an assigned laboratory custodian and an alternate who are responsible for overseeing the reception of all controlled custody samples. Controlled custody samples will be of the highest priority and will be analyzed before all other environmental samples.

f) In the field and in the laboratory, the number of individuals having access to these samples should be kept to a minimum to lessen the number of potential witnesses. Then the samples are not in the immediate possession of the individual having official custody, they must be kept in a locked enclosure.

SOP H.3 INTERFERENCES AND POTENTIAL PROBLEMS

The following are interferences or potential problems associated with sample preservation, storage, and handling:

- Samples should be protected from sunlight which may initiate photodegradation of sample components.
- Delaying sample preservation may cause chemical reactions to occur, altering original sample composition.
- Improper sample preservation may adversely affect analytical results.
- Inadequate sample volume may prohibit the appropriate analyses from being performed.

- Samples can become contaminated if they come in contact with human flesh; therefore, appropriate protective gloves (i.e., rubber, latex, or plastic) should be worn at all times during sampling collection and preservation.

- Samples can also become contaminated from equipment used to collect and preserve the sample; therefore, all sample collection and preservation equipment must be kept clean.

SOP H.4 EQUIPMENT/APPARATUS

The equipment/apparatus required to collect samples must be determined on a site-specific basis. Refer to the specific SOPs for sampling techniques, which include lists of the equipment/apparatus required for sampling.

In general, the following specific equipment/apparatus may be required for proper sample preservation:

- t-handle samplers
- plastic baggies and packaging
- safety equipment
- glass and plastic bottles (various sizes)
- preservatives (acids, bases, and/or ice)

SOP H.5 REAGENTS

Reagents required for preservation of samples are specified in Table 1. The preservatives required are specified by the analyses to be performed.

SOP H.6 PROCEDURES

Check with the analytical lab to determine which sample container and preservative are required for each analysis. Utilize laboratory provided sample containers which have previously had preservative added to the appropriate sample container. Once aqueous samples are collected, then immediately cool samples to $\leq 4^{\circ}C$.

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Table 1

METHOD HOLD TIME, CONTAINER AND PRESERVATION GUIDE

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Parameter	Matrix	Container	Preservative	Max Hold Time
2, 3, 7, 8-TCDD	Soil	4oz Glass Jar		90/40 Days
2, 3, 7, 8-TCDD	Water			90/40 Days
Acidity	Water			14 Days
Alkalinity	Water			14 Days
Alpha Emitting Radium Isotopes	Water		HNO_3	180 days
Anions by IC, including Br, Cl, F, NO_2, NO_3, SO_4	Water			Br, Cl, F, SO_4 (28 Days) NO_2, NO_3 (48 Hours)
Aromatic and Halogenated Volatiles	Soil	5035 vial kit or 4oz jar		14 days
Aromatic and Halogenated Volatiles	Water		HCl, $Na_2S_2O_3$	14 Days
Bactena, Total Plate Count	Water		$Na_2S_2O_3$	24 Hours
Base/Neutrals and Acids	Soil	4oz Glass Jar		14/40 Days
Base/Neutrals and Acids	Water		HCl, $Na_2S_2O_3$	7/40 Days
Base/Neutrals, Acids & Pesticides	Water		HCl, $Na_2S_2O_3$	7/30 Days
BOD/cBOD	Water			48 hours
BTEX/Total Hydrocarbons	Air	Summa Canister		14 Days
BTEX/Total Hydrocarbons	Air	Tedlar Bag		48 Hours
Chloride	Water			28 Days
Chlorinated Herbicides	Soil	4oz Glass Jar		14/40 Days
Chlorinated Herbicides	Water		HCl, $Na_2S_2O_3$	14/28 Days
Chorine, Residual	Water			Analyze within 15 minutes
COD	Water		H_2SO_4	28 Days
Color	Water			48 Hours
Condensable Particulate Emissions	Air	Solutions		6 Months
Cyanide, Reactive	Water			28 Days
Cyanide, Total and Amenable	Water		NaOH	14 Days, 24 Hours if Sulfide present
Diesel Range Organics	Soil	4oz Glass Jar		14/40 Days
Diesel Range Organics	Water			7/40 Days
Dioxins & Furans	Air	PUF		30/45 Days
EDB & DBCP	Water		HCl, $Na_2S_2O_3$	14 Days
Explosives	Water			7/40 Days
Explosives	Soil	4oz Glass Jar		14/40 Days
Ferrous Iron	Water			Immediate
Flashpoint/Ignitability	Water			28 Days
Fluoride	Water			28 Days
Gamma Emitting Radionuclides	Water		HNO_3	180 days
Gas Range Organics	Water		HCl	14 Days
Gasoline Range Organics	Soil	5035 vial kit or 4oz jar		14 days
Gross Alpha (NJ 48Hr Method)	Water		HNO_3	48 Hrs
Gross Alpha and Gross Beta	Water		HNO_3	180 days
Haloacetic Acids	Water		NH_4Cl	14/7 Days
Hardness, Total ($CaCO_3$)	Water		HNO_3	6 Months
Hexavalent Chromium	Water		50% NaOH	24 Hours
Hydrogen Halide & Halogen Emissions	Air	Solutions		6 Months
Lead Emissions	Air	Filter/Solutions		6 Months
Low Level Mercury	Water		BrCl	90 days (if preserved and oxidized)
Mercury	Soil	4oz Glass Jar		28 days
Mercury	Water		HNO_3	28 Days
Metals	Air	Filters		6 Months
Metals	Soil	4oz Glass Jar		6 months
Metals (and other ICP elements)	Water		HNO_3	6 Months
Methane, Ethane, & Ethene	Water		HCl	14 Days
Methane, Ethane, Ethene	Air	Summa Canister		14 Days
Methane, Ethane, Ethene	Air	Tedlar Bag		48 Hours
Nitrogen, Ammonia	Water		H_2SO_4	28 Days

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Table 1 (continued)

Parameter	Matrix	Container	Preservative	Max Hold Time
Nitrogen, Kjeldahl	Water		H_2SO_4	28 Days
Nitrogen, Nitrate	Water			48 Hours
Nitrogen, Nitrate & Nitrite	Water		H_2SO_4	28 Days
Nitrogen, Nitrite	Water			48 Hours
Nitrogen, Organic	Water		H_2SO_4	28 Days
Non-Methane Organics	Air	Summa Canister		14 Days
Non-Methane Organics	Air	Tedlar Bag		48 Hours
Odor	Water			24 Hours
Oil and Grease/HEM	Water		H_2SO_4	28 Days
Organochlorine Pesticides and PCB's	Water		HCl, $Na_2S_2O_3$	7/40 Days
Organochlorine Pesticides & PCBs	Air	PUF		7/40 Days
Organochlorine Pesticides and PCB's	Water		HCl, $Na_2S_2O_3$	7/40 Days
Organochlorine Pesticides and PCBs	Soil	4oz Glass Jar		14/40 Days
Organophosphorous Pesticides	Soil	4oz Glass Jar		14/40 Days
Organophosphorous Pesticides	Water		HCl, $Na_2S_2O_3$	7/40 Days
Oxygen, Dissolved (Probe)	Water			Analyze within 15 minutes
Paint Filter Liquid Test	Water			N/A
Particulates	Air	Filters		6 Months
Permanent Gases	Air	Summa Canister		14 Days
Permanent Gases	Air	Tedlar Bag		48 Hours
pH	Water			Analyze within 15 minutes
Phenol, Total	Water		H_2SO_4	28 Days
Phosphorus, Orthophosphate	Water			Filter within 15 minutes, Analyze within 48 Hours
Phosphorus, Total	Water		H_2SO_4	28 Days
Polynuclear Aromatic Hydrocarbons	Air	PUF		7/40 Days
Polynuclear Aromatic Hydrocarbons	Soil	4oz Glass Jar		14/40 Days
Polynuclear Aromatic Hydrocarbons	Water		HCl, $Na_2S_2O_3$	7/40 Days
Radioactive Strontium	Water		HNO_3	180 days
Radium-226 Radon Emanation Technique	Water		HNO_3	180 days
Radium-228	Water		HNO_3	180 days
Silica, Dissolved	Water			28 Days
Solids, Settleable	Water			48 Hours
Solids, Total	Water			7 Days
Solids, Total Dissolved	Water			7 Days
Solids, Total Suspended	Water			7 Days
Solids, Total Volatile	Water			7 Days
Specific Conductance	Water			28 Days
Stationary Source Dioxins & Furans	Air	XAD Trap		30/45 Days
Stationary Source Mercury	Air	Filters		6 Months, 28 Days for Hg
Stationary Source Metals	Air	Filters		6 Months, 28 Days for Hg
Stationary Source PM10	Air	Filters		6 Months
Stationary Source Particulates	Air	Filter/Solutions		6 Months
Sulfate	Water			28 Days
Sulfide, Reactive	Water			28 Days
Sulfide, Total	Water		NaOH,ZnOAc	7 Days
Sulfite	Water			Analyze within 15 minutes
Surfactants	Water			48 Hours
Total Organic Carbon (TOC)	Water		H_2SO_4 or HCl	28 Days
Total Organic Halogen (TOX)	Water			14 Days
Tritium	Water		HNO_3	180 days
Turbidity	Water			48 Hours
Uranium Radiochemical Method	Water		HNO_3	180 days
Volatiles	Air	Summa Canister		14 Days
Volatiles	Air	Tedlar Bag		48 Hours
Volatiles	Air	Summa Canister		14 Days
Volatiles	Air	Tedlar Bag		48 Hours
Volatiles	Air	Summa Canister		14 Days
Volatiles	Soil	5035 vial kit or 4oz jar		14 days
Volatiles	Water		HCl	14 Days
Volatiles	Water		HCl	14 Days (7 unpreserved)

Figure 1. Typical Chain-of-Custody Record